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ACADEMIC LIBRARIES SUPPORT CROSS-DISCIPLINARY INNOVATION AND ENTREPRENEURSHIP

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Abstract

Supporting innovation is essential in today's academic ecosystem, and libraries are well-positioned to connect prospective entrepreneurs with the myriad resources and services available. Libraries are able to leverage pre-existing collaborations and partnerships with groups both inside and outside the university (from local community groups to international level organizations); libraries' status as information brokers across disciplinary boundaries also enables them to make new connections with a wide array of potential stakeholders. Librarians from different subject specialties will share experiences and discuss ways in which libraries can support global entrepreneurship efforts by university faculty, staff, and students, as well as the general public. This will include the results of several collaborative projects that have helped create an environment of innovation and creativity within this university's libraries. Notably, this includes an effort to create a map of available campus and community tools for entrepreneurs and inventors, mentorship for a student innovation and invention competition, ongoing support for design projects within the engineering and technology curricula, providing entrepreneurship support for disabled veterans, and outreach to entrepreneurs and independent inventors within the university's great local community.

Keywords: entrepreneurship, innovation support

Introduction

Purdue University, located in the Midwest United States, is a large, public university with an enrollment of more than 40,000 [Purdue University, 2017]. Additionally, Purdue is the land-grant school for the state of Indiana, a designation meaning the university receives an endowment from the state in exchange for having a focus on agriculture and the mechanical arts (now referred to as engineering), and a requirement to disseminate knowledge and support to the state of Indiana [Committee on the Future of the Colleges of Agriculture in the Land Grant University System, 1995]. This mandate, and support from university administration, has created an environment of innovation and put entrepreneurship at the forefront of a multitude of efforts across campus. One of the most visible means of support is Discovery Park. Built as a hub for innovation, it is a complex of facilities on 40 acres on the southwest edge of campus [Purdue University, 2015b]. The Burton D.

Morgan Center for Entrepreneurship, located within Discovery Park, houses the Certificate in Entrepreneurship and Innovation Program and the Purdue Foundry [Purdue University, 2015a]. Purdue also supports a technology realization program, Entrepreneurial Leadership Academy, entrepreneurial graduate program, an Office of Technology Commercialization, and a Business Technology and Entrepreneurship Club, among other efforts and programs. There is a focused effort across campus to support faculty and student entrepreneurs.

With this university-wide focus on innovation and mandate to support the community, the Purdue Libraries are well-positioned to help support these programs, and others, with entrepreneurial research. Librarians have been working collaboratively in a myriad of ways with entrepreneurship programs across campus. This paper will discuss some of our most successful efforts, along with our attempt to catalog entrepreneurship services and programs across campus.

Engineering & Technology Design Project Support

An entrepreneurial mentality, which includes demonstrating curiosity, pursuing knowledge and making connections between sources of information, and creating value for others [KEEN, 2018] is important for future engineers, whether or not they pursue their own business interests or work for companies in industry [Bosman and Fernhaber, 2018].

The Purdue Libraries provide support for several design-focused undergraduate courses in the Schools of Mechanical Engineering (ME) and Engineering Technology (ET) at Purdue. The ET programs consist of mechanical engineering technology (MET), manufacturing engineering technology (MFET), and electrical and engineering technology (ECET). Table 1 provides a summary of the courses, student populations, and the Libraries' support activities, which largely consist of designing and delivering in-class lessons on business and technical research, creating library guides (e.g. Libguides) for students to refer to throughout their design projects, and providing team consultations.

Table 1:

Course	Undergraduate Student Population	Purdue Libraries' Support
ME 263 Introduction to ME Design, Innovation & Entrepreneurship	Sophomore ME students	In-class session that covers business and technical research; team consultations with engineering and business librarians; library guide
ME 463 Senior Design	Senior ME students	Team consultations with engineering and business librarians; library guide
MET 102 Production Design & Specifications	Sophomore and junior MET students	Flipped classroom lesson with interactive standards tutorials; library guide
MET 302 CAD in the Enterprise	Junior and senior MET students	In-class patents lesson; library guide

MET 401/ MFET 480/ ECET 430 (combined senior capstone)	Senior MET, MFET, and ECET students	Five in-class lessons that cover searching and evaluating resources, patents, and technical standards; team consultations with engineering and business librarians; library guide
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Summary of Purdue Libraries' support for undergraduate engineering and technology design-focused courses

In-Class Lessons

Librarians partner with engineering and technology faculty members to design in-class lessons to support student design activities. For some courses, such as ME 263, the support consists of a 'one-shot' library session co-instructed by an engineering and business librarian that provides an introduction to business and technical research. The ME 263 students work in teams of 3-4 to prototype a solution to a design prompt. The prompts change every term, but have included topics such as assistive devices, energy harvesting solutions, and CubeSats (miniature satellites), and always require teams to demonstrate there is evidence of market demand for their proposed solution. The in-class library session covers the basics of market and industry research, as well as searching for relevant technical literature (e.g. journal articles, trade articles, technical standards, patents).

For other courses, such as MET 102, MET 302, and MET 401/MFET 480/ECET 430 (a combined senior design course), the Libraries' provide more in-depth and frequent instruction, such as creating assignments that are integrated into design modules, developing tutorials [Phillips, Fosmire and McPherson, 2017] that are used with "flipped classroom" lessons, and going into more depth with technical research, where entire class or lab sessions are devoted to specific information literacy topics (e.g. searching and evaluating resources, technical standards, and patents).

Library Guides

All of the courses described in Table 1 include design assignments that span either the entirety of the course, or at minimum, several weeks of a term. For this reason, librarians create course guides on the Libguides platform for students to be able to independently discover and access the resources most relevant to their projects' needs throughout the term. All of the course guides can be accessed through the Purdue Libraries "Library Guides" website: <http://guides.lib.purdue.edu/?b=p>.

Team Consultations

The student senior design teams in ME 463 and MET 401/MFET 480/ECET 430 pursue projects that are typically unrelated to the projects of their classmates. For example, some recent ME 463 projects include a real-time sports analytics system for cricket players, an automated tourniquet for military and police applications, and a cacao pod opening device to be used in third world countries. For this reason, the teams' business and technical research needs vary greatly. To provide customized support, librarians offer both in-class (MET 401/MFET 480/ECET 430) and out of class (ME 463 and MET 401/MFET 480/ECET 430) team research consultations.

Soybean Innovation Competition

Started in 1994, the Student Soybean Innovation Competition requires participants to create an innovative product from soybeans. First prize for the winning team is \$20,000, second is

\$10,000, and third is \$5,000. In order to progress through the competition, products must be shown to have environmental benefits, technical benefits, feasibility, and novelty. This requires students to investigate and report on the marketability and patentability of their inventions. Since the second year of the competition, librarians have been involved in working with students on the research component of the project. Early on, librarians would provide an instruction session to the entire group of students at the beginning of the project, and a few student groups would follow up with consultations. More recently, librarians give a short talk to the large group about what this research can entail, then encourage students to schedule consultations for more in-depth searching with a librarian. The current competition director also strongly encourages students to meet with a business and patent librarian, helping to further solidify the consultation model.

Students consulting with the business librarian learn how to conduct market research and discuss concepts such as performing a market analysis and determining a target market size for their products. Often, the students in the competition are coming from a STEM (science, technology, engineering, and math) background, and are looking for concrete formulas to determine these things. The business librarian works with them to help them understand the ambiguity of business research and make decisions using the best available evidence. Students consulting with the patent librarian learn about intellectual property and the United States' patent system, and learn to perform basic patent searching methods. The patent librarian recommends patent searching tools appropriate to the students' level of expertise. Anecdotally, the groups who won the competition in both 2017 and 2018 met with the librarians on multiple occasions, and more than any other groups.

Entrepreneurship Bootcamp for Veterans with Disabilities

The Entrepreneurship Bootcamp for Veterans with Disabilities (EBV) is a program designed to help veterans start their own business through entrepreneurship classes, faculty support, resources, and mentorship. The program was founded in 2007 at Syracuse University, and has grown to include ten universities across the country [EBV National Program, 2018]. Purdue joined nine years ago, and the libraries have worked hard to support the program in collaboration with the other EBV institutions across the country [Hoppenfeld, Wyckoff, Henson, Mayotte, & Kirkwood Jr, 2013]. EBV is delivered to veterans in three phases. Phase 1 is a 30 day, instructor led online course teaching the basics on entrepreneurship and the language of business. Phase 2 is a nine-day residency at one of the ten partner universities where veterans work with university faculty and accomplished entrepreneurs to create a defined business plan and pitch. Phase 3 includes 12 months of support and mentorship, including a year of business library database access [EBV Program & Schedule, 2018].

Librarians work with the program primarily in phases two and three. During phase two, when the veterans are on campus, a librarian gives a business research instruction session, and three business librarians work individually with the veterans while they develop their business and marketing plans. This includes working with the veterans in the evenings, as their schedules are full for nearly the entire business day, and they are working on their plans during off-hours. Librarians are also available remotely to the veterans during the 12 months of phase three, providing help via phone and email. All veterans going through the EBV program have access to consortial databases specifically for the program, however Purdue goes a step further and gives veterans attending EBV at Purdue access to all library databases, as well as Qualtrics survey software, for the full 12 months of phase three.

Support of Foundry/WomenIN

Between 2013 and 2017, Purdue University helped to launch 165 startups around the world, provided \$279.1 million in funding, and helped create 200 plus new positions [Sequin, 2018].

The Purdue Foundry is an entrepreneurship and commercialization accelerator that assists students, faculty, and local and global alumni in startup creation by providing help with entity formation, ideation, market analysis, and business model development [Purdue Foundry, 2018]. Librarians currently work in a train-the-trainer capacity, teaching Foundry staff how to do market researching using the library databases. Additionally, librarians visit entrepreneurs in the Firestarter program, an intensive 11-week program designed to teach participants how to launch their business. Librarians also collaborate with the Entrepreneurs in Residence, attend events, and provide resources.

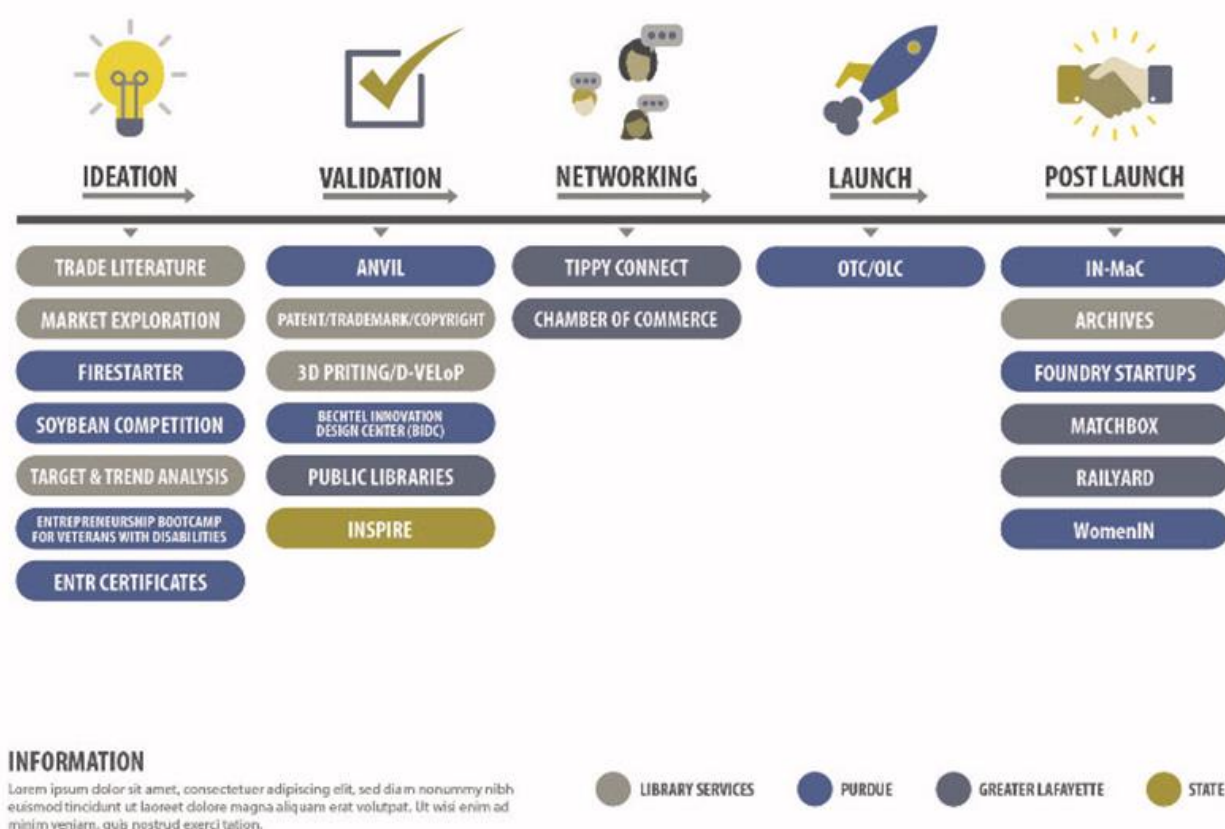
Within the Foundry is WomenIN, an initiative designed to support women entrepreneurs in the state of Indiana with resources and a supportive ecosystem [WomenIN, n.d.]. As part of Purdue's land-grant mission, WomenIN opens up resources typically reserved for Purdue Foundry clients to all women in the state. Librarians communicate regularly with the WomenIN staff to discuss library resources, participate in online group conversations, and attend events to network with local women entrepreneurs.

Mapping Project

As the previous examples show, many individuals and groups in the Purdue University Libraries support entrepreneurship and technology commercialization activities in some capacity, both for the campus and surrounding the community. However, these activities are not coordinated. In an effort to better understand and support entrepreneurship activities on the Purdue University campus, a group of librarians was tasked with mapping campus stakeholders and determining both what the Libraries are already doing and where opportunities exist for targeted outreach.

The first step in mapping entrepreneurship activities was defining the term "entrepreneurship" in this context, followed by an environmental scan of the campus and community. This generally involved meeting with various stakeholders and letting their responses uncover connecting resources and organizations. The investigators next surveyed Purdue Libraries faculty. While this survey largely confirmed what was already known, it did expose additional services unknown to subject specialists, revolving around management and licensing of the university's intellectual property via the University Copyright Office and the Archives & Special Collections. Beyond campus activity, a search of the literature revealed alternate models for support of entrepreneurship and technology commercialization, notably a model from the University of Arizona [Dewland & Elliott, 2015; Elliot et al., 2017] which involves the creation of a Commercialization Library Group to share information, coordinate entrepreneurship activities, partner with external stakeholders, and avoid duplication of effort.

Figure 1:



The entrepreneurship ecosystem of Purdue University and its community.

This effort revealed three main findings. The first was the map itself, as shown in Figure 1, identifying stakeholders and aligning their work with the ideation, validation, networking, launch, and post-launch phases of the entrepreneurial process. This handily illustrated that the Libraries' role was primarily in the ideation and validation phases, helping entrepreneurs identify potentially viable ideas and attempt to confirm their viability. The second finding was the lack of awareness and coordination within the Libraries itself. While the map showed the breadth of the Libraries' activities related to entrepreneurship and technology commercialization, it also showcased the lack of an overall guiding vision for these activities. The third finding was that the Libraries, by virtue of their connections on campus and extant services, were well-positioned to take a stronger role in supporting entrepreneurship and technology commercialization on campus.

With all of this in mind, the investigators made a series of recommendations. The Libraries could continue to operate on this level, contributing to entrepreneurship efforts in an ad hoc way without coordination or intention; the Libraries could continue to operate on this level, but attempt to better brand and market its services in hopes of creating new outreach opportunities; the Libraries could create a coordination group similar to the aforementioned University of Arizona model; or the Libraries could formalize its support for entrepreneurship by creating a new position to support this work and giving that person the resources necessary to do so. While the Libraries' administration is still determining how best to respond to these recommendations, the value in conducting this

research has already shown its value through greater awareness of campus stakeholders on the part of those librarians already in position to provide support.

Conclusion

The Purdue Libraries support entrepreneurs in a multitude of ways through instruction, collaboration, and resources. Librarians are constantly striving to improve our efforts and outreach in these areas. Through initiatives like the mapping project, we are working to assess our current activities and determine the most effective use of our limited time and resources. As innovation efforts change and expand across campus, the Purdue Libraries are working to create a dynamic and flexible program that continues to serve stakeholders from students to faculty to community members and global citizens.

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